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(54) **DISC BRAKE**

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(51) **Int. Cl.**

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F16D 55/226	(2006.01)
F16D 65/18	(2006.01)
F16D 65/56	(2006.01)
F16D 121/04	(2012.01)

(52) **U.S. Cl.**

CPC ***F16D 55/226*** (2013.01); ***F16D 65/18*** (2013.01); ***F16D 65/567*** (2013.01); *F16D 2121/04* (2013.01)

(58) **Field of Classification Search**

CPC F16D 65/56; F16D 65/567; F16D 65/58; F16D 65/60; F16D 65/66; F16D 65/68; F16D 65/70

USPC .... 188/71.7, 71.8, 71.9, 196 V

See application file for complete search history.

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(57) **ABSTRACT**

Disclosed herein is a disc brake having a carrier at which a pair of pad plates is installed and a caliper housing slidably installed on the carrier and provided with a cylinder allowing a piston to be installed therein, the disc brake including an adjuster installed in the piston, a push rod installed in the cylinder and provided with a flange extending toward an inner circumferential surface of the cylinder, a ramp coupled to the flange to prevent rotation of the push rod and moving along with the push rod and seated in a seating groove provided at a rear wall of the cylinder, a spring case fixed to the cylinder and forming a predetermined accommodation space between the cylinder and the push rod, and an elastic member arranged in the accommodation space of the spring case to provide elastic force to the push rod and the ramp.

8 Claims, 7 Drawing Sheets

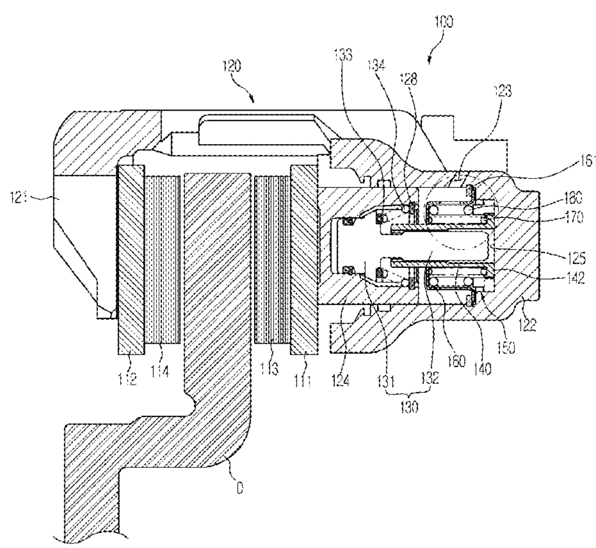

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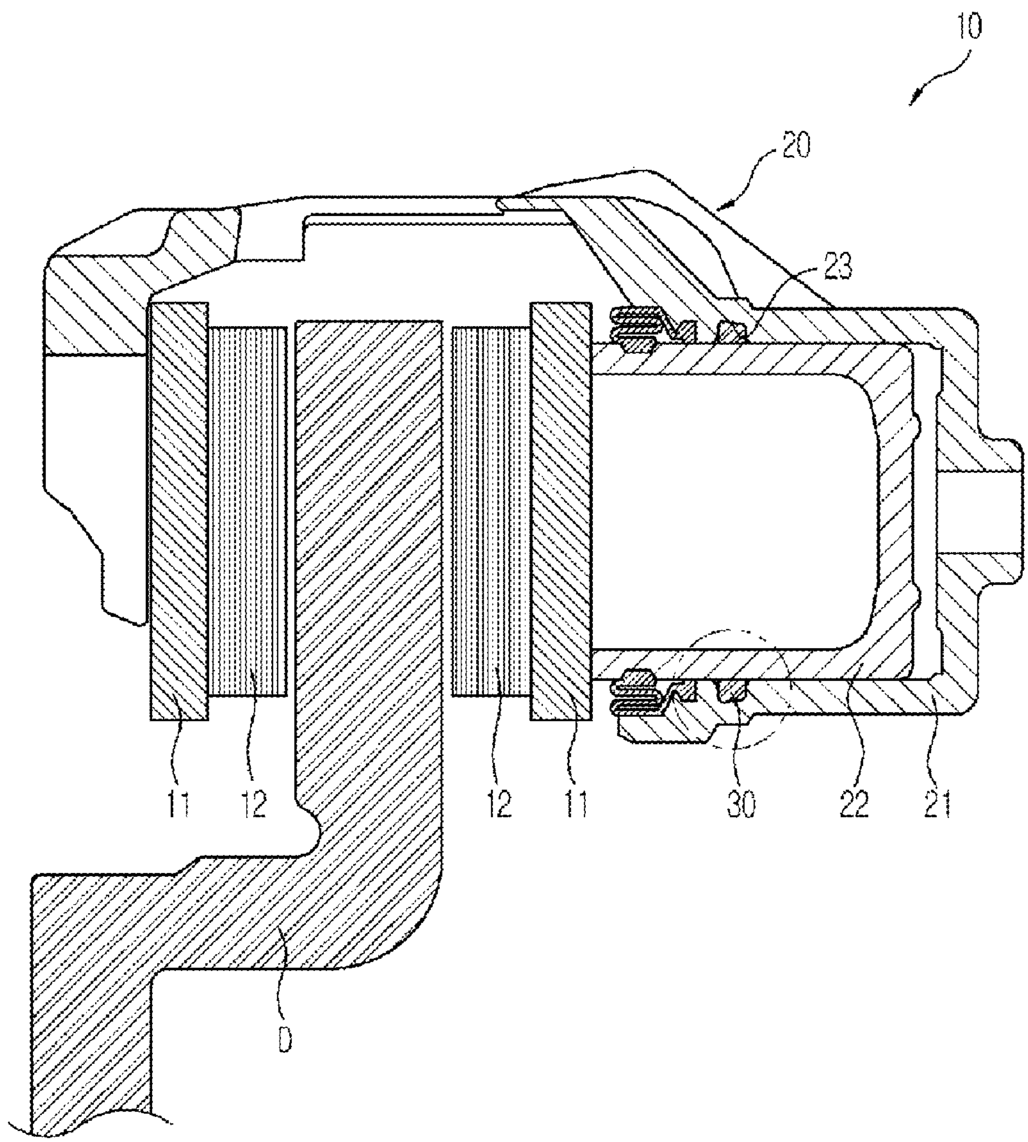
FIG. 1



RELATED ART

FIG. 2

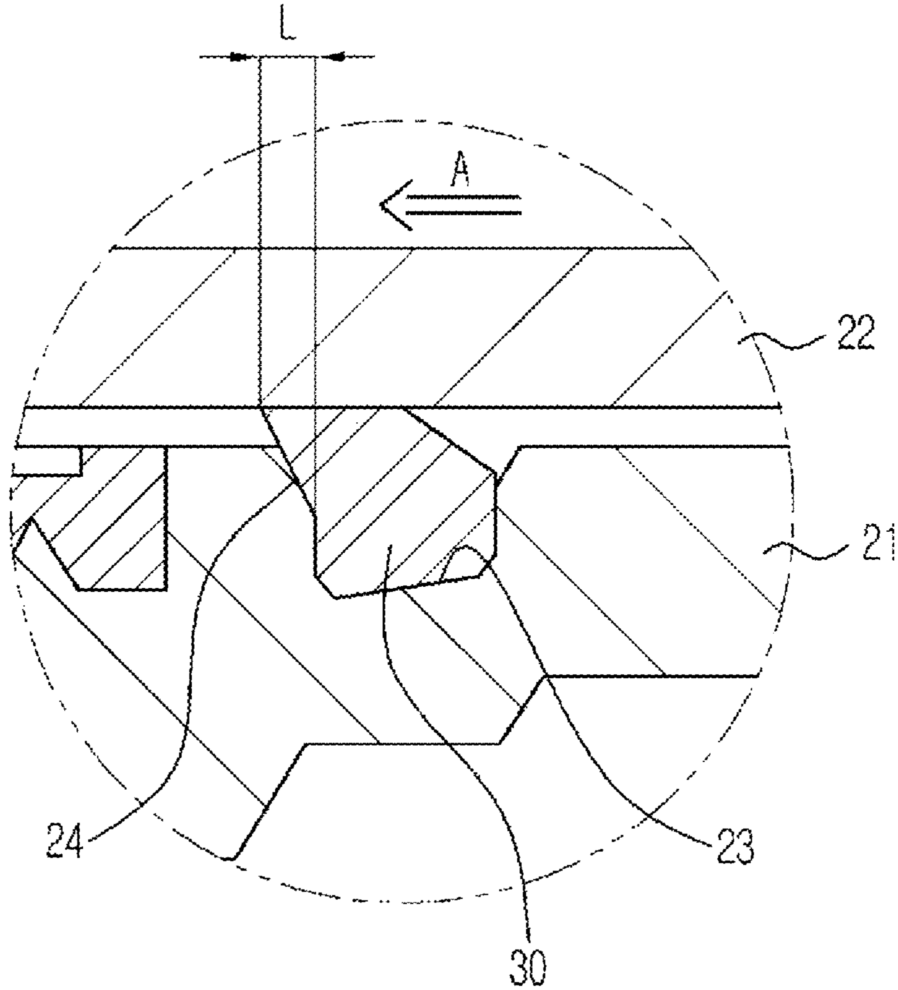
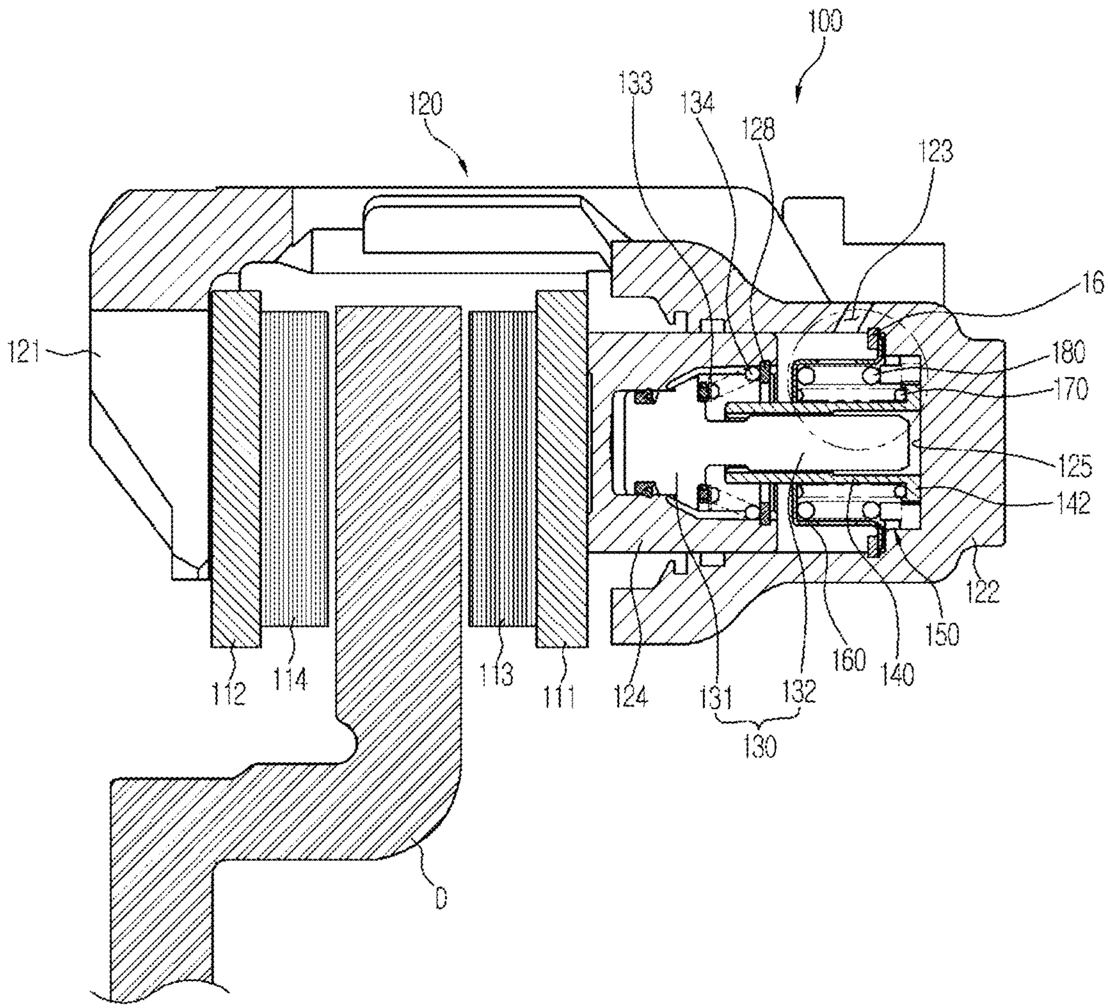


FIG. 3


100
120
133
134
128
123
161
121
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170
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124
111
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FIG. 4

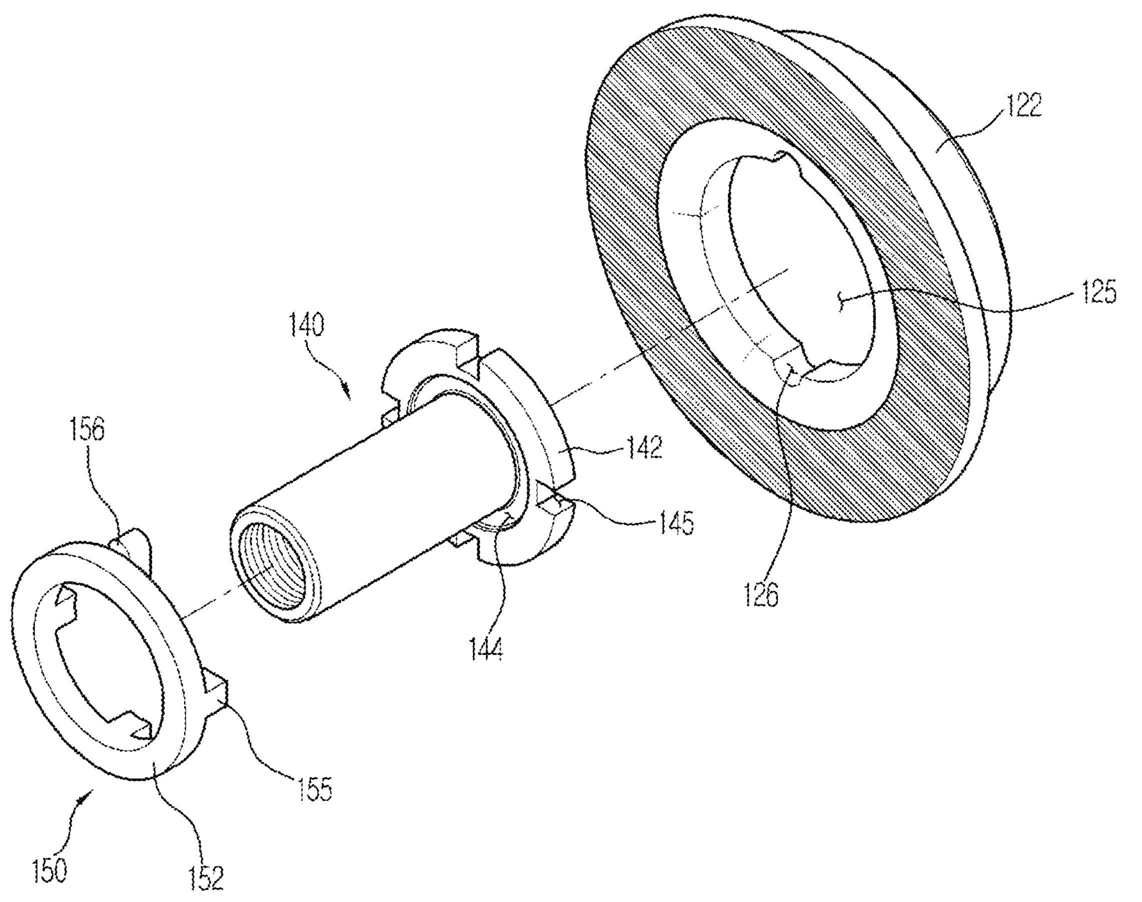


FIG. 5

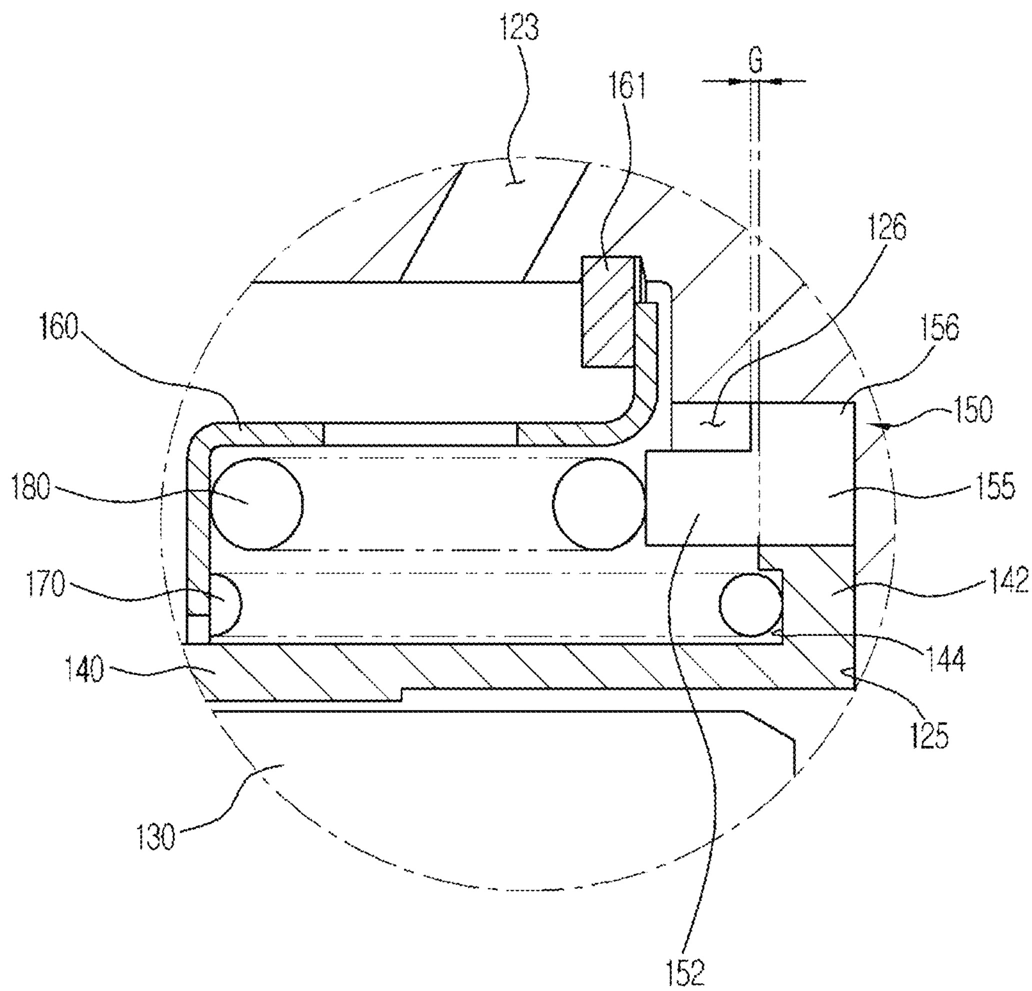


FIG. 6

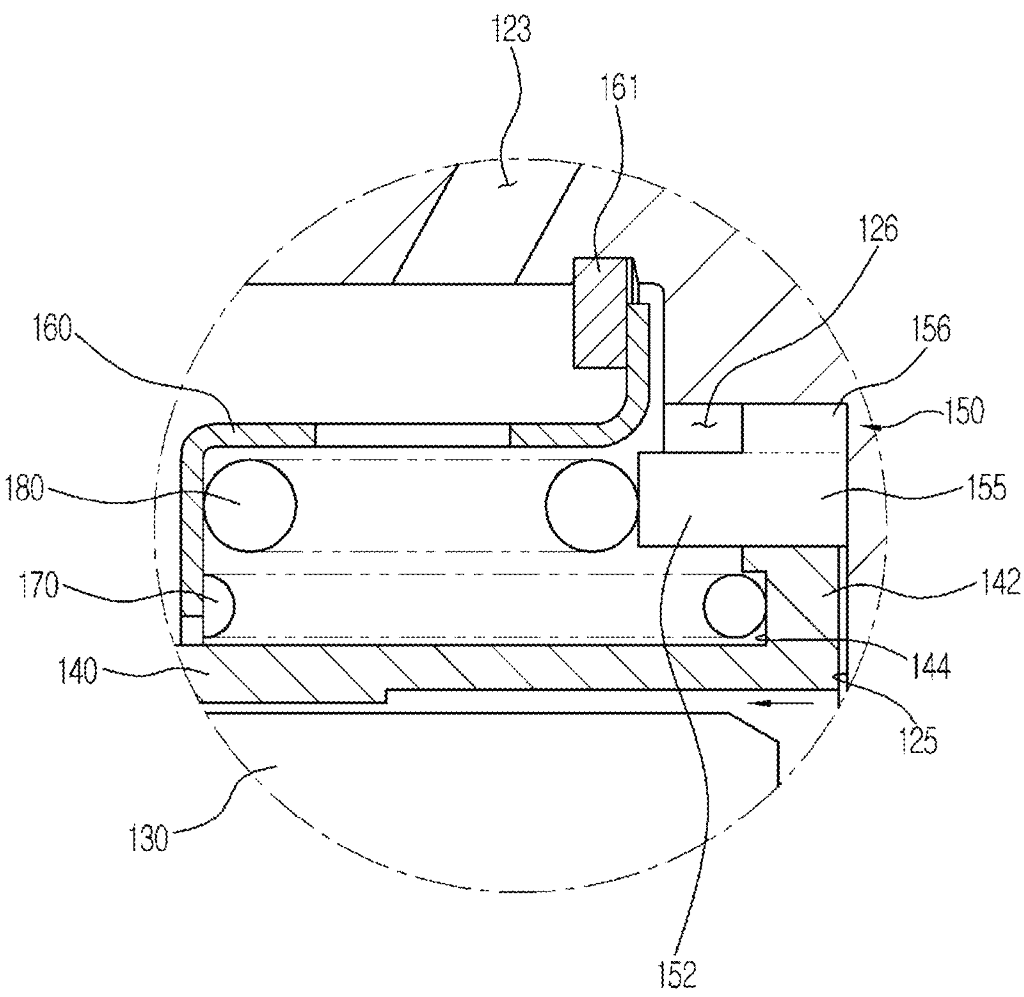
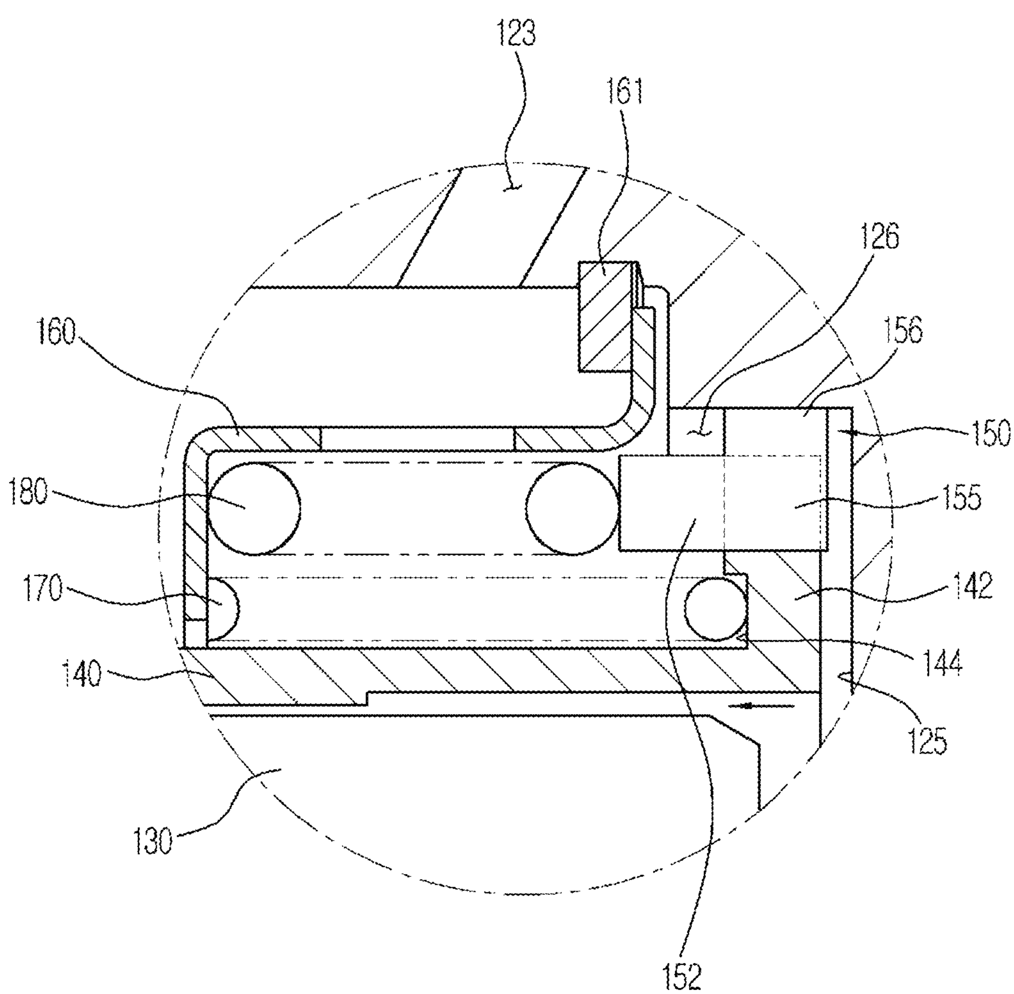


FIG. 7



DISC BRAKE

CROSS-REFERENCE TO RELATED APPLICATION(S)

This application claims priority to Korean Patent Application No. 10-2012-0079120, filed on Jul. 20, 2012 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND

1. Field

Embodiments of the present invention relate to a disc brake which may stably return a piston when braking operation is terminated and improve the effect of return of the piston.

2. Description of the Related Art

A disc brake is a device that is generally used to slow a vehicle to a stop by forcibly pressing friction pads against both sides of a disc rotating together with a wheel of the vehicle.

To reduce brake drag that is caused by continuous contact between the disc and the friction pads after the braking operation, two solutions may be considered for such disc brakes. One solution is to move the piston backward using a sealing member and a roll-back chamfer. The other solution is to move the piston backward by applying a compression spring to pad plates, which are pressed against the disc.

FIG. **1** is a cross-sectional view illustrating a conventional disc brake, and FIG. **2** is a view illustrating moving the piston backward using a sealing member and a roll-back chamfer.

As shown in FIGS. **1** and **2**, a disc brake **10** includes a pair of pad plates **11** to generate braking force by being pressed against a disc D, a carrier (not shown) to support the pair of pad plates **11**, a caliper housing **20** installed at the carrier and provided with a piston **22** slidably installed in a cylinder **21** to apply pressure to the pair of pad plates **11**, and a sealing member **30** interposed between an inner surface of the cylinder **21** and an outer surface of the piston **22** of the caliper housing **20**. The sealing member **30** serves to seal the space between the inner surface of the cylinder **21** and the outer surface of the piston **22** to prevent leakage of brake oil and to allow the piston **22** to be moved forward in the direction of arrow A, as shown in FIG. **2**, for implementation of braking and moved back to an original position thereof by resilience of the sealing member **30**, by which the sealing member **30** recovers an original shape thereof, when the braking operation is terminated.

The sealing member **30** is formed in a shape of a ring to be inserted into a circular roll-back chamfer **23** provided in the inner surface of the cylinder **21**, and has a quadrilateral cross section. In addition, the roll-back chamfer **23** to accommodate the sealing member **30** is provided with a slope **24** at a side of the opening facing the direction opposite to the direction of braking (indicated by arrow A) to allow the sealing member **30** to be deformed when the piston **22** is moved forward in the direction of braking, as shown in FIG. **2**.

When the piston **22** is moved forward to perform braking, the sealing member **30** is deformed as shown in FIG. **2**. When the braking operation is terminated, the sealing member **30** returns in the direction opposite to arrow A to an original state thereof shown in FIG. **1**. Accordingly, the piston **22** is moved back to an original position thereof by the resilience of the sealing member **30**. This action is referred to as roll-back. The return distance of the piston **22** depends on the deformed width L of the sealing member **30**.

However, in the conventional disc brake **10**, since the side of the sealing member **30** facing the direction in which braking is performed is a flat surface roughly perpendicular to the outer surface of the piston **22** as shown in FIG. **1**, the deformed width L of the sealing member **30** is limited as shown in FIG. **2**, and thereby the return distance of the piston **22** may be short. That is, the deformation of the conventional sealing member **30** is small, and thus increasing the return distance of the piston **22** may be limited. If the return distance of the piston **22** is short, the friction pads **12** attached to the pad plates **11** may not be sufficiently separated from the disc when the braking pressure is released, resulting in wear of the friction pads **12**. That is, the amount of roll-back given according to the machining allowance of the cylinder **21** and friction between the sealing member **30** and the piston **22** may result in high drag.

Further, when the piston **22** returns to an original position thereof, the piston **22** may undergo knock-back, which refers to a phenomenon in which the piston **22** moves forward again by elastic force of the sealing member **30** after moving in the return direction. In addition, when the braking pressure is released, the caliper housing **20** slidably moved from the carrier returns to an original position thereof along with elastic return of the piston **22** by the sealing member **30**. However, when the caliper housing **20** is moved leftward in this process, the piston **22** may undergo back slip, that is, slipping in the direction of forward (leftward) movement of the piston **22**, which is caused by the sealing member **30** installed at the roll-back chamfer.

Meanwhile, in the case that a compression spring (not shown) is used to move the piston **22** backward, the compression spring is installed at the pad plate **11**, which is pressed against the disc D, to provide elastic force in the direction opposite to that of pressing the pad plate **11** against the disc D.

However, when the compression spring is used, the amount of roll-back increases as the friction pad **12** wears, resulting in poor initial brake feel. Further, excessive roll-back of the piston **22** may occur due to the compression spring, resulting in a sinking brake pedal.

SUMMARY

Therefore, it is an aspect of the present invention to provide a disc brake which is provided with a low-pressure spring and a high-pressure spring to operate according to low pressure and high pressure when braking is performed, thereby enhancing return of a piston and securing a space between the disc and the friction pads through restoring force of the piston when braking operation is terminated.

It is another aspect of the present invention to provide a disc brake that has a push rod supporting a low-pressure spring and a ramp supporting a high-pressure spring which are adapted to move together by engaging with each other, thereby allowing the push rod and the ramp to be coaxially maintained when the brake is applied or released.

Additional aspects of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned from practice of the invention.

In accordance with one aspect of the present invention, a disc brake having a carrier at which a pair of pad plates is installed to be movable forward and backward and a caliper housing which is slidably installed on the carrier and provided with a cylinder allowing a piston to be installed therein to be movable forward and backward by hydraulic brake pressure, may include an adjuster installed in the piston to prevent the pad plates from moving away from a disc and to maintain the pad plates a constant distance from the disc, a push rod installed in the cylinder, a front portion thereof being screw-coupled to the adjuster and a rear portion thereof being provided with a flange extending toward an inner circumferential surface of the cylinder, a ramp coupled to the flange to prevent rotation of the push rod and to move along with the push rod and seated in a seating groove provided at a rear wall of the cylinder, a spring case having an end of one side thereof fixed to the cylinder and forming a predetermined accommodation space between an inner circumferential surface of the cylinder and the push rod, and an elastic member arranged in the accommodation space of the spring case to provide elastic force to the push rod and the ramp.

The push rod may be provided with a plurality of coupling grooves arranged equally spaced apart along an outer circumferential surface of the flange and recessed inward, and the ramp may be provided with a ring-shaped body disposed at a front portion of the flange and a plurality of coupling protrusions formed at positions corresponding to the coupling grooves and protruding rearward from the body.

At least one of the coupling protrusions may be provided with a support protrusion protruding from an outer surface thereof in a radial direction, and the seating groove of the cylinder may be provided with a support groove corresponding to the support protrusion at a position corresponding to the support protrusion.

In addition, a leading end surface of the flange may be spaced a constant distance apart from the body to form a gap in a longitudinal direction.

The elastic member may include a low-pressure spring arranged in the spring case, one end thereof being supported on a surface of the other side of the spring case and the other end thereof being supported by the flange to provide elastic force in a direction of movement of the piston, and a high-pressure spring arranged in the spring case to be spaced a constant distance apart from the low-pressure spring, one end thereof being supported on the surface of the other side of the spring case and the other end thereof being supported by the ramp to provide elastic force in the direction of movement of the piston.

The flange may be provided with a recess recessed to support the low-pressure spring.

In addition, the adjuster may be provided with a head portion adapted to contact the piston and a rod extending rearward from the head portion and provided with threads on an outer circumferential surface thereof, wherein a rear wall of the head portion of the adjuster and an inner side surface of the piston may be respectively provided with a wash installed thereon, and a washer spring may be provided between the washers to cause the adjuster to be pressed against the piston by elastic force of the washer spring.

A distance between the threads of the adjuster and threads of the push rod screw-coupled to each other may decrease to allow the adjuster to be closely coupled to the push rod.

A hydraulic duct to receive hydraulic brake pressure to be applied to the piston may be provided at one end of the caliper housing.

BRIEF DESCRIPTION OF THE DRAWINGS

These and/or other aspects of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

FIG. **1** is a cross-sectional view showing a conventional disc brake;

FIG. **2** is a partially enlarged view illustrating operation of the conventional disc brake;

FIG. **3** is a cross-sectional view showing a disc brake according to an exemplary embodiment of the present invention;

FIG. **4** is a perspective view illustrating installation of a push rod and a ramp provided to the disc brake according to the illustrated embodiment of the present invention;

FIG. **5** is a partially enlarged view illustrating a gap formed between the push rod and the ramp arranged at the disc brake according to the illustrated embodiment of the present invention; and

FIGS. **6** and **7** are views illustrating operation of the disc brake according to the illustrated embodiment of the present invention.

DETAILED DESCRIPTION

Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

FIG. **3** is a cross-sectional view showing a disc brake according to an exemplary embodiment of the present invention, and FIG. **4** is a perspective view illustrating installation of a push rod and a ramp provided to the disc brake according to the illustrated embodiment of the present invention.

Referring to FIGS. **3** and **4**, a disc brake **100** includes a caliper housing **120** at which a piston **124** is installed to be moved forward and backward by hydraulic brake pressure, a carrier (not shown) fixed to a vehicle body and coupled with the caliper housing **120** to allow the caliper housing **120** to be slidable, a pair of pad plates **111** and **112** installed at the carrier to be spaced a certain distance apart from each other and slidable toward a disc D rotating together with a wheel to be pressed against the disc D, an adjuster **130** to prevent the pad plates **111** and **112** from moving away from the disc D and maintain the pad plates **111** and **112** at a certain distance from each other, a push rod **140** screw-coupled with the adjuster **130**, a ramp **150** coupled with the push rod **140** to support the push rod **140** and installed at a cylinder **122** of the caliper housing **120**, a spring case **160** forming a predetermined accommodation space between the inner lateral surface of the cylinder **122** and the push rod **140**, and an elastic member including a low-pressure spring **170** and a high-pressure spring **180**.

The carrier (not shown) is fixed to a knuckle in the vehicle body through mounting bolts (not shown), and the caliper housing **120** is slidably coupled to opposite ends of the carrier through a guide rod (not shown). In addition, the pad plates **111** and **112** are mounted at the center of the carrier to be spaced a certain distance apart from each other and slidable in the directions in which they face each other.

The pad plates **111** and **112** are divided into an inner pad plate **111** disposed to adjoin the piston **124**, which will be described below, and provided with a friction pad **113** attached to an inner side surface thereof, and an outer pad plate **112** disposed to adjoin a finger **121**, which will be described below, and provided with a friction pad **114** attached to an inner side surface thereof. The disc D is formed in a shape of a circular plate rotating together with a wheel (not shown), and rotates with a portion thereof interposed between the pad plates **111** and **112**.

The caliper housing **120** includes the finger **121** to operate the outer pad plate **112** and a cylinder **122** provided with a hydraulic duct **123** allowing hydraulic brake pressure to be transferred therethrough.

The finger **121** is formed to bend downward from the front portion of the caliper housing **120** to surround the outer pad plate **112** at the outside of the outer pad plate **112**. Accordingly, when braking is applied, the caliper housing **120** is slidably moved rightward from the carrier to cause the outer pad plate **112** to be pushed toward the disc D and pressed against the disc D by the finger **121**.

The cylinder **122** is arranged at the rear side of the caliper housing **120** to allow hydraulic brake pressure generated in a master cylinder (not shown) to be transferred, and the piston **124** is installed in the cylinder **122** to be movable forward and backward. That is, the piston **124** installed in the cylinder **122** is moved forward and backward within the cylinder **122** by the hydraulic brake pressure. Formed at the rear wall of the cylinder **122** is a seating groove **125** allowing the push rod **140** and the ramp **150**, which will be described later, to be seated therein. The seating groove **125** will be described below.

The piston **124** is formed in a shape of a cup having one opened side. A head portion **131** of the adjuster **130**, which will be described later, is inserted into the inner central portion of the piston **124** to contact the piston **124**.

The adjuster **130** includes a head portion **131** installed in the piston **124** inserted into the cylinder **122** to contact the piston **124**, and a rod **132** extending from the head portion **131** and provided with threads on the outer circumferential surface thereof. As described above, the head portion **131** is inserted into the piston **124** through the open portion of the piston **124** to contact the piston **124**.

Such an adjuster **130**, which serves to prevent the gap between the disc D and the pad plates **111** and **112** from expanding as the friction pads **113** and **114** attached to the pad plates **111** and **112** wear and to maintain a constant distance therebetween, has washers **128** and **133** installed respectively at the inner lateral surface of the piston **124** and the rear wall of the head portion **131** and a washer spring **134** arranged between the washers **128** and **133**. That is, the adjuster **130** is arranged to contact the piston **124** by the washer spring **134** installed between the inner lateral surface of the piston **124** and the head portion **131**. Therefore, as the washer spring **134** presses the adjuster **130** toward the leading end of the piston **124**, the adjuster **130** is kept in contact with the piston **124** even when the friction pads **113** and **114** of the pad plates **111** and **112** are worn out due to friction with the disc D to cause the position of the piston **124** to be shifted toward the inner pad plate **111**.

The push rod **140** installed in the cylinder **122** is screw-coupled to the rear side of the adjuster **130**, i.e., the rod **132**. Thereby, when the piston **124** is moved forward by hydraulic brake pressure, the adjuster **130** coupled with the piston **124** is moved forward together with the piston **124**, and the push rod **140** screw-coupled with the adjuster **130** is also moved forward. Thereby, the distance between the threads of the adjuster **130** and the push rod **140** screw-coupled with each other decreases. That is, a gap that is generally present between the threads of the adjuster **130** and the push rod **140** is reduced as the adjuster **130** is arranged to be pressed in the direction of forward movement of the piston **124** (leftward), and thereby the adjuster **130** and the push rod **140** simultaneously move.

The push rod **140** is formed to have a hollow core and threads arranged on the inner circumferential surface thereof to be screw-coupled to the adjuster **130**. In addition, provided at the rear portion of the push rod **140** is a flange **142** extending toward the inner circumferential surface of the cylinder **122**. The push rod **140** is seated in the seating groove **125** along with the ramp **150**, which will be described below, and is prevented from rotating by the ramp **150**.

As the push rod **140** is screw-coupled with the adjuster **130** and rotation thereof is prevented, the adjuster **130** is movable in the longitudinal direction of the push rod **140**. That is, when the piston **124** moves due to wear of the friction pads **113** and **114**, the adjuster **130**, which is caused to closely contact the piston **124** by the washer spring **134**, rotates to move from the push rod **140** by the traveling distance of the piston **124** to remain in close contact with the piston **124**. Thereby, the distance between the disc D and the pad plates **111** and **112** to which pressure is applied by the piston **124** is kept constant.

Meanwhile, the flange **142** of the push rod **140** is provided with a plurality of coupling grooves **145** arranged equally spaced along the outer circumferential surface of the flange **142** and recessed inward. As the coupling protrusions **155** formed at the ramp **150** are fitted into the coupling grooves **145**, the push rod **140** is coupled to the ramp **150**.

The ramp **150** is provided with a body **152** disposed at the front portion of the flange **142** and a plurality of coupling protrusions **155** protruding from the body **152** to the rear side. The coupling protrusions **155** are formed at the positions corresponding to those of the coupling grooves **145** formed at the flange **142**.

The body **152** is formed in the shape of a ring to support the high-pressure spring **180**, which will be described later. The diameter of the outer circumferential surface of the body **152** corresponds to that of the flange **142**, while the diameter of the inner circumferential surface of the body **152** is formed to be greater than that of the portion of the push rod **140** coupled to the adjuster **130**. That is, the push rod **140** is spaced apart from the inner circumferential surface of the body **152**. This is intended to allow the low-pressure spring **170**, which will be described later, to be supported by the flange **142**.

Meanwhile, at least one of the coupling protrusions **155** of the ramp **150** is provided with a support protrusion **156** protruding from the outer lateral surface thereof in a radial direction. A support groove **126** is formed in a shape corresponding to that of the support protrusion **156** at a position of the seating groove **125** of the cylinder **122** corresponding to that of the support protrusion **156**. Accordingly, the ramp **150**, rotation of which is limited by the support protrusion **156**, may be guided in an axial direction to move forward and backward. Thereby, the push rod **140** coupled to the ramp **150** is prevented from rotating by the ramp **150**. The push rod **140** engages with the ramp **150**, thereby moving together with the same.

When the push rod **140** is coupled to the ramp **150** and seated in the seating groove **125**, the leading end surface of the flange **142** is spaced a certain distance apart from the body **152** to form a gap in a longitudinal direction. That is, the length of the coupling protrusions **155** is greater than the thickness of the flange **142** to form a gap G of a certain size as shown in FIG. **5**. This is intended to secure a distance between the disc D and the pad plates **111** and **112**.

The spring case **160** is arranged to form a predetermined accommodation space between the push rod **140** and the inner lateral surface of the cylinder **122**. Specifically, one end of the spring case **160** is fixed to the ramp **150** by a snap ring **161**. An elastic member to return the push rod **140** and the ramp **150** to original positions thereof to return the piston **124** is provided in the spring case **160**. The elastic member includes a low-pressure spring **170** and a high-pressure spring **180**. One end of the low-pressure spring **170** is supported by one side surface of the spring case **160** and the other end thereof is supported by the flange **142**. The high-pressure spring **180** is spaced a certain distance from the low-pressure spring **170**. One end of the high-pressure spring **180** is supported by the one side surface of the spring case **160** and the other end thereof is supported by the leading end surface of the ramp **150** coupled to the push rod **140**, i.e., by the body **152**. Here, the leading end surfaces of the flange **142** and the ramp **150** which support the low-pressure spring **170** and high-pressure spring **180** are arranged in a stepped manner, forming a step portion. The low-pressure spring **170** and the high-pressure spring **180** are spaced apart from each other in a longitudinal direction by the step portion.

As the structure to support the low-pressure spring **170** and the high-pressure spring **180** is provided as above, the low-pressure spring **170** is supported by the flange **142** and the high-pressure spring **180** is supported by the body **152** when the disc brake **100** does not operate. When the brake is applied and the adjuster **130** and the push rod **140** are moved according to movement of the piston **124**, the low-pressure spring **170** supported by the flange **142** of the push rod **140** is first compressed as shown in FIG. **5**. As the low-pressure spring **170** is compressed by a distance beyond the size of the gap G between the flange **142** and the body **152** of the ramp **150**, the flange **142** contacts the body **152** of the ramp **150** and the push rod **140** and the ramp **150** move together. That is, the ramp **150** supports the high-pressure spring **180**, and thereby both the low-pressure spring **170** and the high-pressure spring **180** are compressed.

Meanwhile, the flange **142** is provided with a recess **144** formed to be recessed to stably support the low-pressure spring **170**.

Hereinafter, operation of the disc brake **100** as above will be described.

The disc brake **100** according to the illustrated embodiment is first installed at a vehicle. That is, the gap G is formed between the flange **142** of the push rod **140** and the body **152** of the ramp **150**, and thereby a gap between the disc D and the pad plates **111** and **112** is secured.

When the brake is applied in this state, hydraulic brake pressure is introduced into the cylinder **122**, causing the piston **124** to apply pressure to the inner pad plate **111**. Thereby, the friction pad **113** attached to the inner pad plate **111** is pressed against the disc D. At the same time, the caliper housing **120** slides from the carrier (not shown) according to reaction force, and thereby the finger **121** applies pressure to the outer pad plate **112**, causing the friction pad **114** attached to the outer pad plate **112** to be pressed against the disc D to generate braking force.

Meanwhile, as the piston **124** moves, the adjuster **130** adjoining the piston **124** and the push rod **140** coupled to the adjuster **130** move together. At this time, the push rod **140** moves to compress only the low-pressure spring **170** supported by the flange **142**. That is, as shown in FIG. **6**, the push rod **140** moves a distance corresponding to the gap G between the push rod **140** and the ramp **150** to compress the low-pressure spring **170**. Further, once the push rod **140** moves by the gap G, the flange **142** contacts the body **152** of the ramp **150**, and then the push rod **140** and the ramp **150** move together (see FIG. **7**). That is, both the low-pressure spring **170** and the high-pressure spring **180** are compressed. When the push rod **140** and the ramp **150** move, rotation thereof is limited by the support protrusion **156** and movement thereof is guided with respect to the cylinder **122**.

Additionally, as the low-pressure spring **170** and the high-pressure spring **180** are arranged to be respectively supported by the push rod **140** and the ramp **150** and the gap G is formed between the push rod **140** and the ramp **150**, the low-pressure spring **170** and the high-pressure spring **180** may be operable at different pressures, for example, a low pressure and a high pressure. That is, at low pressure, the push rod **140** moves only a distance corresponding to the gap G. At high pressure, the push rod **140** engages and moves with the ramp **150**.

After braking is completed, the push rod **140** and the ramp **150** are returned to original positions thereof by the high-pressure spring **180** and the low-pressure spring **170**, and thereby the piston **124** smoothly moves backwards, without suffering drag. Once the ramp **150** is caused to contact the seating groove **125** of the cylinder **122** by the high-pressure spring **180**, the low-pressure spring **170** finally moves the push rod **140** by a distance corresponding to the gap G to return the push rod **140** to the original position thereof. In addition, since the adjuster **130** screw-coupled to the push rod **140** and the piston **124** return to original positions thereof, the effect of return of the piston **124** is enhanced. Thereby, the initial gap between the disc D and the friction pads **113** and **114** is maintained. In addition, as the push rod **140** and the ramp **150** are arranged to move together, the push rod **140** and the ramp **150** may remain on the same axis.

When the friction pads **113** and **114** wear out due to braking, the distance between the disc D and the pad plates **111** and **112**, i.e., the distance between the disc D and the friction pads **113** and **114** is automatically adjusted by the adjuster **130**.

As is apparent from the above description, a disc brake according to the embodiments of the present invention is provided with a low-pressure spring operating according to low pressure in braking and a high-pressure spring operating according to high pressure, and thus may not only prevent drag by moving the piston backward, but also secure a space between the disc and the pad plates.

In addition, the disc brake according to the embodiments of the present invention may also improve initial brake feel through elimination of increase in the amount of roll-back according to wear of the friction pads which are pressed against a disc.

Thereby, wear of the friction pads due to unnecessary friction between the friction pads and the disc and noise resulting therefrom may be prevented. Moreover, normal braking force may be ensured by allowing the pad plates to be spaced a constant distance from the disc.

Although a few embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

What is claimed is:

1. A disc brake having a pair of pad plates installed to be movable forward and backward and a caliper housing which is slidably installed and provided with a cylinder allowing a piston to be installed therein to be movable forward and backward by hydraulic brake pressure, the disc brake comprising:

an adjuster installed in the piston to prevent the pad plates from moving away from a disc and to maintain the pad plates a constant distance from the disc;

a push rod installed in the cylinder, a front portion thereof being screw-coupled to the adjuster and a rear portion thereof being provided with a flange extending toward an inner circumferential surface of the cylinder;

an element coupled to the flange to prevent rotation of the push rod and to move along with the push rod and seated in a seating groove provided at a rear wall of the cylinder;

a spring case having an end of one side thereof fixed to the cylinder and forming a predetermined accommodation space between an inner circumferential surface of the cylinder and the push rod; and

an elastic member arranged in the accommodation space of the spring case to provide elastic force to the push rod and the element, wherein the elastic member comprises:

a low-pressure spring is arranged in the spring case, one end thereof being supported on a surface of the other side of the spring case and the other end thereof being supported by the flange to provide elastic force in a direction of movement of the piston; and

a high-pressure spring is arranged in the spring case to be spaced a constant distance apart from the low-pressure spring, one end thereof being supported on the surface of the other side of the spring case and the other end thereof being supported by the element to provide elastic force in the direction of movement of the piston.

2. The disc brake according to claim **1**, wherein:

the push rod is provided with a plurality of coupling grooves arranged equally spaced apart along an outer circumferential surface of the flange and recessed inward; and

the element is provided with a ring-shaped body disposed at a front portion of the flange and a plurality of coupling protrusions formed at positions corresponding to the coupling grooves and protruding rearward from the body.

3. The disc brake according to claim **2**, wherein:

at least one of the coupling protrusions is provided with a support protrusion protruding from an outer surface thereof in a radial direction; and

the seating groove of the cylinder is provided with a support groove corresponding to the support protrusion at a position corresponding to the support protrusion.

4. The disc brake according to claim **2**, wherein a leading end surface of the flange is spaced a constant distance apart from the body to form a gap in a longitudinal direction.

5. The disc brake according to claim **1**, wherein the flange is provided with a recess recessed to support the low-pressure spring.

6. The disc brake according to claim **1**, wherein the adjuster is provided with a head portion adapted to contact the piston and a rod extending rearward from the head portion and provided with threads on an outer circumferential surface thereof,

wherein a rear wall of the head portion of the adjuster and an inner side surface of the piston are respectively provided with washers installed thereon, and a washer spring is provided between the washers to cause the adjuster to be pressed against the piston by elastic force of the washer spring.

7. The disc brake according to claim **1**, wherein a distance between the threads of the adjuster and threads of the push rod screw-coupled to each other decreases to allow the adjuster to be coupled to the push rod.

8. The disc brake according to claim **1**, wherein a hydraulic duct to receive hydraulic brake pressure to be applied to the piston is provided at one end of the caliper housing.

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